

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
1 July 2004 (01.07.2004)

PCT

(10) International Publication Number
WO 2004/055288 A1

(51) International Patent Classification⁷: E04C 1/42,
E04B 2/10

(21) International Application Number:
PCT/PL2003/000141

(22) International Filing Date:
12 December 2003 (12.12.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
P-357844 18 December 2002 (18.12.2002) PL
P-362011 5 September 2003 (05.09.2003) PL

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(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

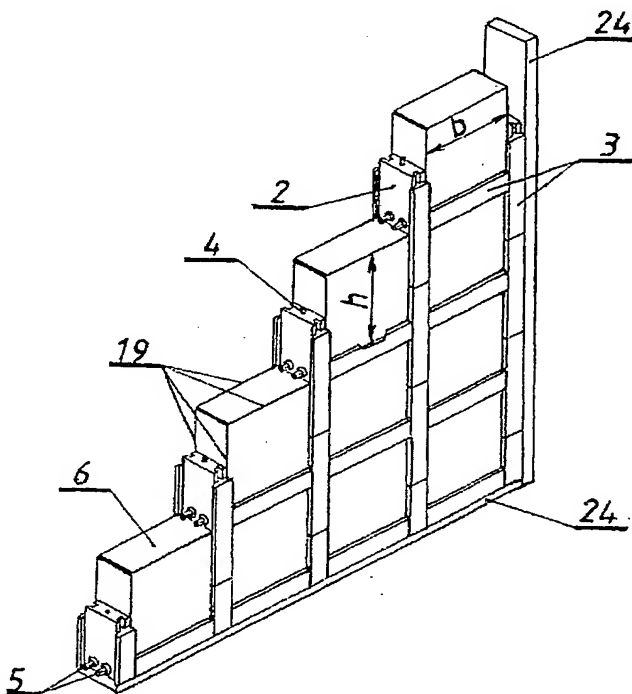
(84) Designated States (*regional*): ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: WALL CONSTRUCTION USING HOLLOW GLASS BUILDING ELEMENTS



(57) Abstract: The construction unit to be used in erecting both flat and arched profiled walls consists of supporting elements being the horizontal and vertical fasteners (1 and 2) in a form of joined blocks, which on their frontal sides are provided with longitudinal holes (7 and 12) with mortises (10), whereas on the lateral sides of the vertical fasteners (2) they are provided with transverse holes (13) overlapping with the holes (7) of the horizontal fasteners (1), in these holes the treaded fasteners combining the entire construction are being mounted. The longitudinal holes (7 and 12) with mortises (10) of the fasteners may be given a form of the grooved recesses (7a and 12a) with mortises (10a). On both external sides, to the horizontal and vertical fasteners -profiled slats (3) are being fixed, edges (16) of which are somewhat advanced outside the lateral edges (17 and 18) of these fasteners. The threaded fastener is composed of a stud-bolt (4) and a longitudinal nut (5) co-operating with it. The horizontal fast has a length (a) preferably equal to the length (b) of the glass hollow tile (6), whereas the transverse holes (13) of the vertical fastener are situated in relation to the frontal surfaces (25), containing each other after the assembly, at a distance (s) equal to the sum of a half of height (h) of the hollow tile and a half of thickness (d) of the horizontal fastener. In order to construct arched profiled walls, the unit is provided with the distance pads (20) in a form of tongues, mounted in front of the convex section, between the side surfaces (21) of the vertical fastener and the frontal surfaces (22) of the horizontal fastener.

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WALL CONSTRUCTION USING HOLLOW GLASS BUILDING ELEMENTS

The object-matter of the invention is the construction unit to be used in erecting building walls, being an element of the interior decoration, with the application of glass hollow tiles.

The unit for erecting straight or arched walls with the application
5 of cubicoidal glass profiles, mainly hollow tiles, is known; it consists of a vertical and a horizontal circumferential slat, horizontal fasteners with a length equal to the length of the wall as well as of vertical fasteners with a length equal to the height of the hollow tiles. These fasteners have a form of bars or ladders constituting reinforcement elements. In
10 the case of erecting arched walls both circumferential slats and horizontal fasteners are adequately profiled to match the wall contour. Reinforcing fasteners are placed in horizontal and vertical gaps between hollow tiles. Such reinforcing fasteners are being filled with construction mortar starting from the lower slat, on which the
15 successive rows of hollow tiles are being put; it must be noted that ends of fasteners are introduced into profiled circumferential slats.

The unit for non-mortar erection of straight walls, being the element of the interior decoration of the erected building with the application of glass hollow tiles is also known. It embraces the
20 supporting element made of timber. This unit consists of : the frame, horizontal slats with a length equal to the length of the wall and fixed to the frame with catches as well as vertical fasteners with a length equal

to the height of the hollow tile. The slats fill in horizontal joints between rows of hollow tiles, whereas the fasteners fill in vertical joints between individual hollow tiles situated in each row. Fasteners tightened between slats have their lateral side flat or convex, adjusted to
5 the concave contour of lateral walls of the hollow tile.

According to the invention, the construction unit for non-mortar erection of building walls was designed. This unit consists of supporting elements having a rectangular profile and embracing glass hollow tiles that constitute horizontal and vertical fasteners in a form of
10 joining blocks. These fasteners on their frontal sides have longitudinal holes with mortises, which may be formed in a shape of grooved recesses. In the lateral sides of vertical fasteners there are transverse holes overlapping with holes made in horizontal fasteners, in which threaded fasteners are being mounted. On both external sides, to the
15 horizontal and vertical fasteners profiled slats are being fixed, edges of which are somewhat advanced outside the lateral edges of these fasteners. Profiled slats are being fixed to horizontal and vertical fasteners by means of tongue-and-groove joints. The threaded fastener is composed of a stud-bolt and a longitudinal nut co-operating with it.
20 The horizontal fastener has a length preferably equal to the length of the glass hollow tile, whereas transverse holes of the vertical fastener are situated in relation to the frontal surfaces, contacting each other after the assembly, at a distance equal to the sum of a half height of the hollow tile and a half thickness of the horizontal fastener.
25 In order to construct arched profiled walls, the unit is provided with distance pads in a form of tongues, mounted in front of the convex

section between side surfaces of the vertical fastener and frontal surfaces of the horizontal fastener.

The construction unit according to the invention enables easy assembling of both straight and arched profiled walls of buildings or of their fragments with the application of various construction materials including timber, ensuring – on the one hand – the appropriate stability and tightness of the whole construction, and – on the other hand – guaranteeing the high aesthetic qualities being associated with the possibility to functionally operate the light in the interior decoration by means of the adequate selection of glass hollow tiles.

The object-matter of the invention is presented in the example of making shown in the figures, where Fig.1. presents the construction unit within the fragment of the straight wall, constructed with the application of glass hollow tiles from a top perspective view, Fig.2 – the construction unit in the fragment of the wall from the Fig. 1 without glass hollow tiles from a top perspective view, Fig.3 – the construction unit in the fragment of the arched profiled wall, erected with the application of the glass hollow tiles from a top perspective view, Fig.4 – the construction unit in the fragment of the wall from Fig.3 without the glass hollow tiles from a top perspective view, Fig. 5 – the horizontal fastener of the unit in a longitudinal section, Fig. 6 – the horizontal fastener from the Fig. 5 from a front side view, Fig.7 – the horizontal fastener from a side perspective view, Fig.8 – the vertical fastener of the unit in a longitudinal section, Fig. 9 – the vertical fastener in a longitudinal section along the A-A line according to the Fig.8, Fig.10 – the basic vertical fastener from a side perspective view, Fig.11 – shorter vertical fastener from a top perspective view, Fig.12 – disassembled

threaded fastener in a longitudinal section, Fig. 13 – the profiled slat from an inside view, Fig 14, the slat from Fig.13 in a longitudinal section, Fig. 15 – joining of the horizontal fastener with the vertical fasteners in the fragment of a straight wall in a longitudinal section;
5 Fig.16 – joining of the vertical fastener with the horizontal fasteners in the fragment of a profiled arched wall from a top view, Fig.17 – another embodiment of the unit construction elements along with the glass hollow tile from a top perspective unit, Fig.18 – the horizontal fastener of the unit shown in the Fig. 17 from a grooved
10 recesses side view, Fig. 19 – the horizontal fastener from the Fig.18 in a W view from a front side, Fig. 20 – the vertical fastener of the unit shown in the Fig.17 from a grooved recess side view, Fig. 21 – the vertical fastener shown in the Fig. 20 in a W1 view from a front side, and Fig. 22 – joining of the horizontal fastener with the vertical
15 fasteners shown in the Fig. 17 in the fragment of a straight wall in a horizontal section.

The construction unit according to the invention is provided with the horizontal and vertical fasteners 1 and 2 in a form of joining blocks having a rectangular or near-rectangular shape and serving as the
20 supporting elements, to which profiled sealing slats 3 are being fixed. The fasteners and slats compose together a rigid framing for all glass hollow tiles, which form the glazing of construction facilities.

The fasteners 1 and 2 , preferably of the same thickness d, are joined together with the threaded fasteners consisting of stud-bolts 4 and
25 longitudinal nuts 5 co-operating with them. These nuts are at the same time the joints used to fasten together stud-bolts. The stud-bolts directly fastening the vertical fasteners together have such length, that has been

adequately adjusted to the length of these fasteners. On the other hand, stud-bolts fastening the horizontal fasteners together, separated by the vertical fasteners, have a length adequately adjusted to the length of the horizontal fastener and to the thickness of the vertical fastener.

- 5 Glass hollow tiles of the luxfer type have external walls of a rectangular shape. The upper, lower and side walls forming the circumference of the hollow tile have concave surfaces in their central sections.

The horizontal fastener 1, having a length a preferably equal to the length b of the glass hollow tile and a width slightly lower than the
10 thickness of this tile, has at least one and has preferably made two longitudinal holes 7 for stud-bolts 4. These holes are broadened at one side and they form recesses 8 for thrust washers 9 and mortises 10 for nuts 5. In the external sides through their whole length recesses are made, forming grooves 11 preferably of a trapezoidal shape.

- 15 The vertical fastener 2 has at least one longitudinal hole 12 made in it for the stud-bolt 4, which is situated lengthwise the vertical axis of symmetry and which is broadened at one side and forms recess 8 for a thrust washer 9 and a mortise 10 for a nut 5. In the external sides on the whole length recesses are made, forming grooves 11.

- 20 Longer and, at the same time, basic vertical fasteners as shown in the Fig. 8, have preferably a length being the sum of the hollow tile height h and of the horizontal fastener thickness d; they have transverse holes 13 in their central section that overlap with the longitudinal holes of the horizontal fastener during the assembly.

- 25 On the other hand - the remaining, shorter vertical fasteners, forming the side framing of the first and the last layer of the hollow tiles creating the wall, have a length preferably equal to the sum of a half height h of

the hollow tile and thickness d of the horizontal fastener. At the bottom of fasteners, as it is shown in the Fig. 11, two transverse holes 13 are made. Transverse holes of shorter and longer fasteners 2 are situated in relation to the frontal surfaces 25, adhering to each other, at a distance s being equal to the sum of a half height h of the hollow tile and a half of thickness d of the horizontal fastener.

Profiled slats 3, having a width being slightly greater than thickness of the fasteners 1 and 2 and a length adjusted adequately to the lengths of these fasteners, have on their inner side the tongues 14, shape of which is adjusted to a shape of the grooves 11 made in the fasteners, with which they are fastened by means of the front tongue-and-groove joint 15.

The transverse section of the slats has a polygonal contour with stepped-shaped edges 16, advanced a little bit outside the side edges 17 and 18 of the fasteners and reaching above the outside edges 19 of the hollow tiles, what additionally stiffens and, at the same time, seals joints formed between the hollow tiles.

Construction units earmarked for erecting profiled walls with a shape approximate to arch with the application of hollow tiles are provided with horizontal fasteners, in which longitudinal passage holes 7 are increased in order to adequately position stud-bolts 4 during the assembly. These units are additionally provided with distance pads 20 in a form of tongues with a near-rectangular section, which – as it is shown in the Fig. 16 – during the assembly of the fastener are being placed in the front of convexly profiled section of the wall, between the side surfaces 21 of the vertical fastener and the frontal surfaces 22 of the horizontal fastener, as well as side walls of the glass hollow tile.

Preferably on their front sides, the horizontal fasteners have rectangular recesses 23, earmarked for mounting distance pads into them. Such a construction ensures adequate angular positioning of the fasteners 1 and 2 one in relation to another and erecting the intended profiles of walls, in principle without any strain of the threaded fasteners, what ensures the required stability of walls shape. Respectively to the thickness of pads 20, the proper profiles of walls with lower or greater convexity can be obtained. Such the construction solution eases the assembly and construction of various profiles without any necessity to form e.g. the horizontal fasteners in order to receive a suitable shape of their frontal sections.

When erecting free-standing walls inside the building, the external fasteners are being replaced or additionally reinforced with the frame, formed from the vertical and horizontal, uniform elements 24 having a shape of straps, fastened by means of usually known metal fasteners. Short bolts may be mounted on the frame, dimensions of which are adjusted to longitudinal nuts 5, to which then stud-bolts 4 are being fastened. In the case of arched walls, a shape of the frame base is adjusted to a profile of the erected wall.

The horizontal and vertical fasteners can have, according to the recesses on their circumference, adequately profiled surfaces as it is marked by a broken line in the Fig. 6 and 9, what limits to the minimum the possibility to form gaps inside the walls structure.

In the case of constructing window openings and, generally, in the case of erecting external walls, gaps occurring between hollow tiles and fasteners are being filled in with flexible sealing compounds.

The construction unit embracing the one glass hollow tile in principle consists of two horizontal fasteners (the upper and the lower one), four vertical fasteners (two on each side) and eight threaded fasteners, mounted in longitudinal holes 7 and 12. The number of elements is being selected depending on the number of glass hollow tiles used for wall erection. The suitable location of transverse holes 13 makes for this, that the vertical fasteners after assembly meet each other with their frontal surfaces 25 at the height complying with the central section of the hollow tile, and these parts of the fasteners that are pulled outside their horizontal edges form the arms embracing the hollow tile situated within the adjacent layer of the wall up to its half dimension.

These sections of the fastener that are advanced upwards facilitate even laying of hollow tiles and assembly of the next layer. This ensures straight wall construction and guarantees the suitable stiffness and stability of the whole construction.

In the another embodiment of the construction unit, as it is presented in the Fig. 17, 18, 19, 20, 21 and 22, the longitudinal holes 7 along with mortises 10 of the horizontal fastener 1 have a form of the grooved recesses 7a with mortises 10a, and the longitudinal hole 12 along with the mortise 10 of the vertical fastener 2 have a form of the grooved recess 12a with the mortise 10a; moreover – such recesses are made through the whole length of the fasteners. In front of the mortises 10a, earmarked for mounting nuts 5, there are recesses 8a for thrust washers 9. Recesses 7a and 12a of the horizontal and vertical fasteners are provided with a cubicoidal groove of a width slightly exceeding the diameter of the stud-bolt 4 of the threaded fastener, and they are terminated with the bottom 26 having the arched surface

adjusted to the oval shape of the above bolt. The recess bottom is made at such the depth, which enables longitudinal and centric positioning of the bolt, the axis of symmetry of which runs at a depth approximately equal to a half of thickness of the fasteners 1 and 2.

5 From the technological point of view, irrespective of the length of both the horizontal and vertical fasteners, on the whole length we can reach a high precision in mapping the grooved recesses shape e.g. when using milling techniques, what – on the one hand – guarantees even (straight) laying of the stable wall, and – on the other hand – facilitates
10 assembly of the above wall due to the possibility of prior twisting of the threaded fasteners, and then – putting on them the block fasteners. In order to ensure the appropriate stiffness of the wall, during the assembly of the above the vertical fasteners are being reversed in relation to these fasteners that are laid below them by an angle of 180°. Thus, the side
15 opening of the recess 12a of the vertical fastener is being situated alternately on the left and on the right side of posts constituting the supporting construction made of the fasteners. The horizontal and vertical fasteners, profiled slats and distance pads are made of timber, plastic and/or other construction materials with suitable resistance
20 parameters. Adequately selected materials e.g. these made of timber, ensure at the same time high aesthetic qualities of the walls, creating the decorative element in building facilities.

The construction units according to the invention make it possible to erect, with the application of glass hollow tiles, partition walls,
25 external walls as well as the other free-standing decorative screens of large sizes, enabling to functionally operate the light subject to the adequate selection of glass hollow tiles. The unit characterised in the

simple construction makes it possible to assemble the walls (both straight and arched profiled ones) by oneself.

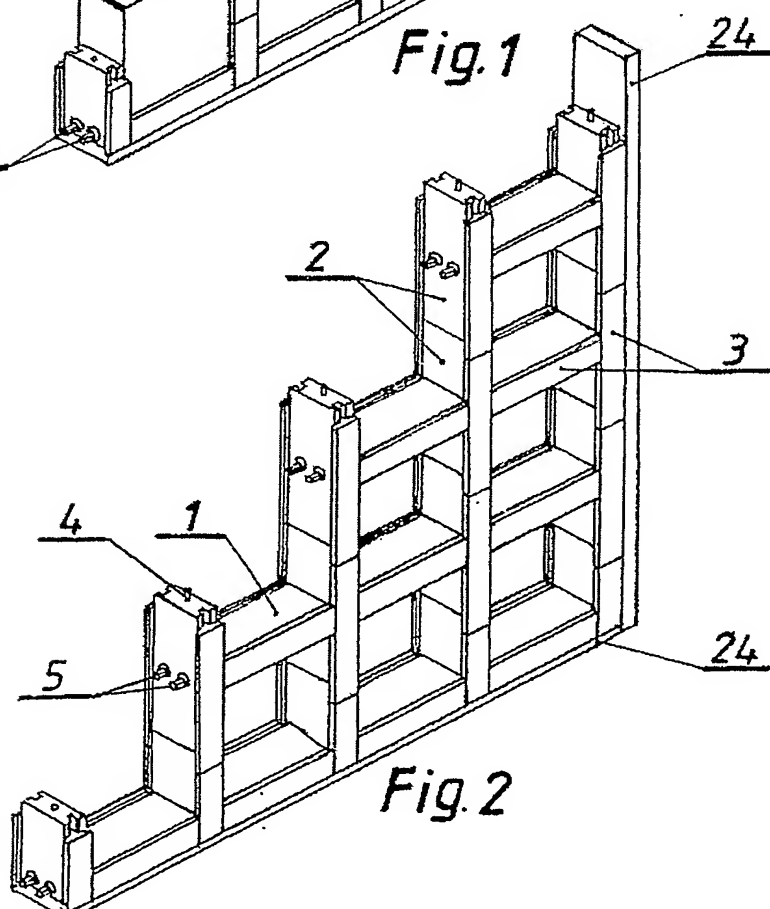
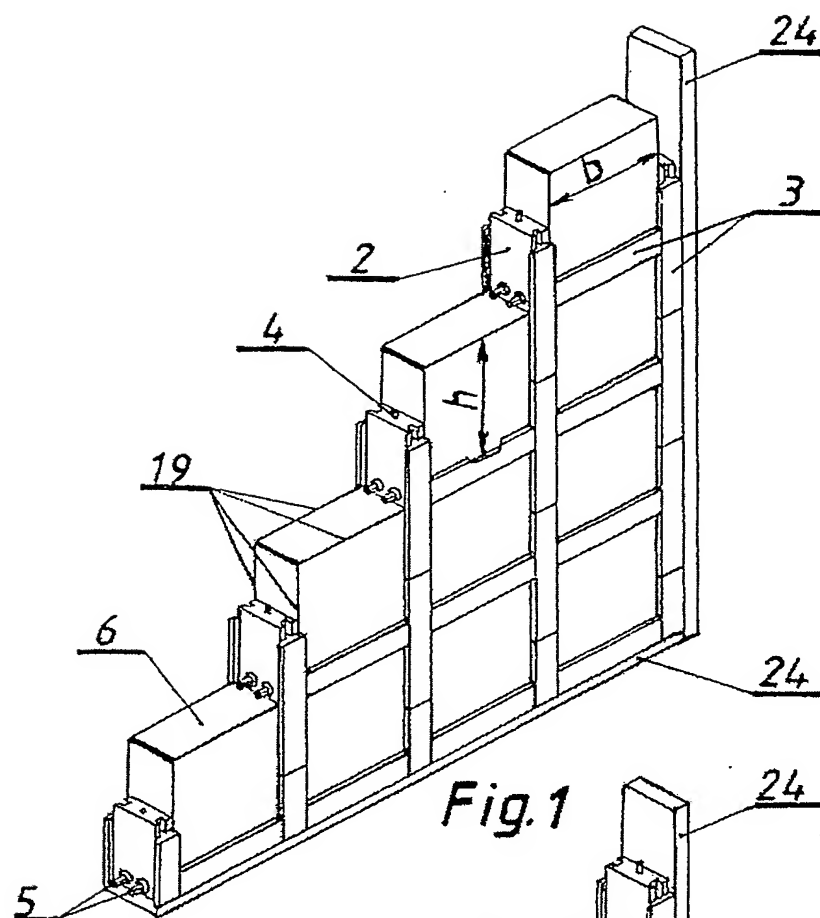
CLAIMS

1. The construction unit to be used in erecting building walls with the application of glass hollow tiles, consisting of the supporting elements embracing hollow tiles of a rectangular contour, characterised in that the supporting elements being the horizontal and vertical fasteners /1/ and /2/ in a form of joined blocks, which on their frontal side are provided with the longitudinal holes /7/ and /12/ with the mortises /10/, whereas on the lateral side of the vertical fasteners /2/ they are provided with the transverse holes /13/ overlapping with the holes /7/ of the horizontal fasteners /1/; in these holes the threaded fasteners combining the entire construction are being mounted.
2. The unit according to the claim 1, characterised in that on both external sides, to the horizontal and vertical fasteners /1/ and /2/ the profiled slats /3/ are being fixed, the edges /16/ of which are somewhat advanced outside the lateral edges /17/ and /18/ of these fasteners.
3. The unit according to the claim 2, characterised in that the profiled slats /3/ are being fixed to the horizontal and vertical fasteners /1/ and /2/ by means of the tongue-and-groove joints /15/.
4. The unit according to the claim 1, characterised in that the threaded fastener is composed of the stud-bolt /4/ and the longitudinal nut /5/ co-operating with it.
5. The unit according to the claim 1, characterised in that the horizontal fastener /1/ has a length /a/ preferably equal to the length /b/ of the glass hollow tile /6/, whereas the transverse holes /13/ of the vertical

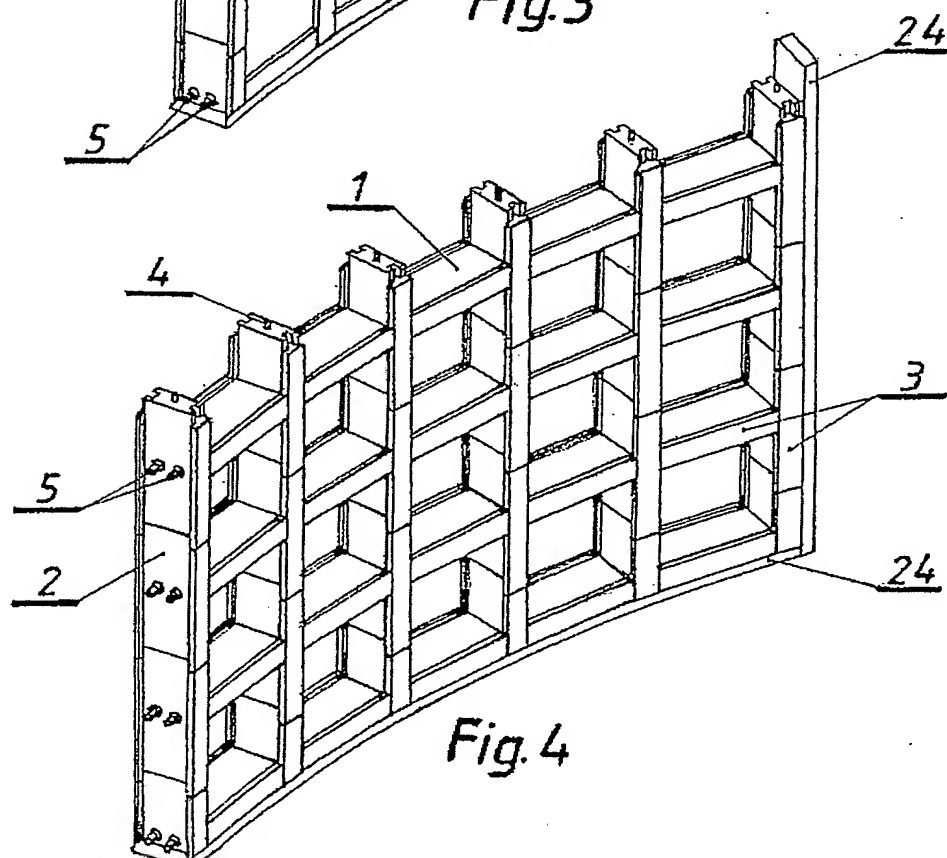
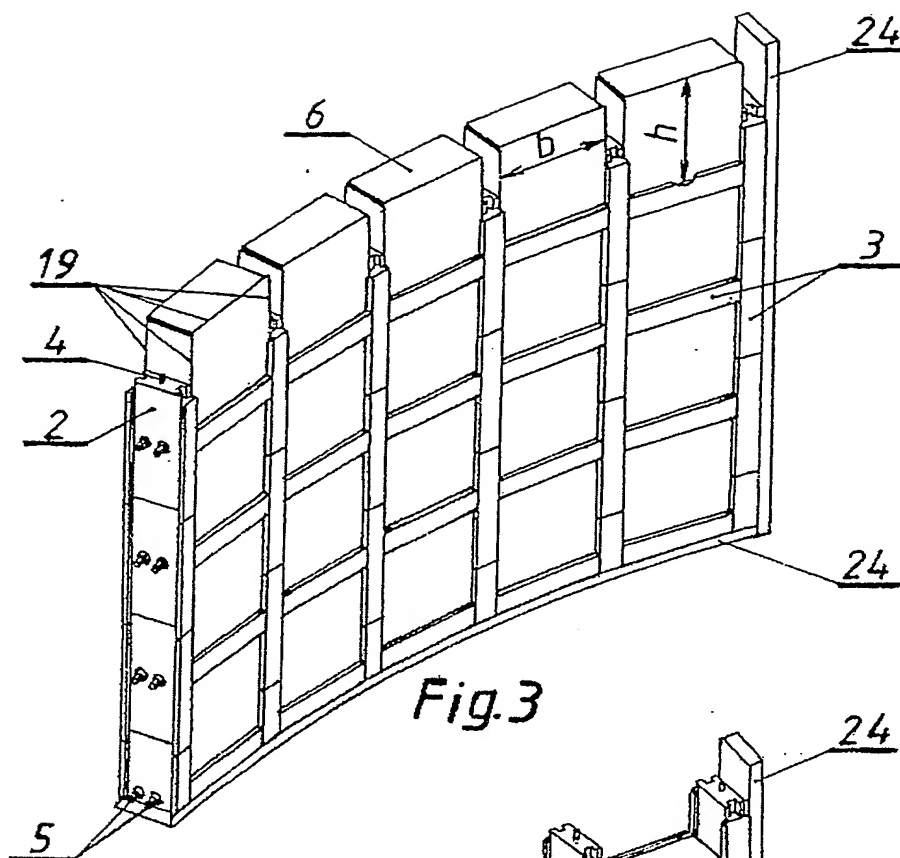
fastener 2 are situated in relation to the frontal surfaces 25, contacting each other after assembly, at a distance s equal to the sum of a half height h of the hollow tile and a half thickness d of the horizontal fastener 1.

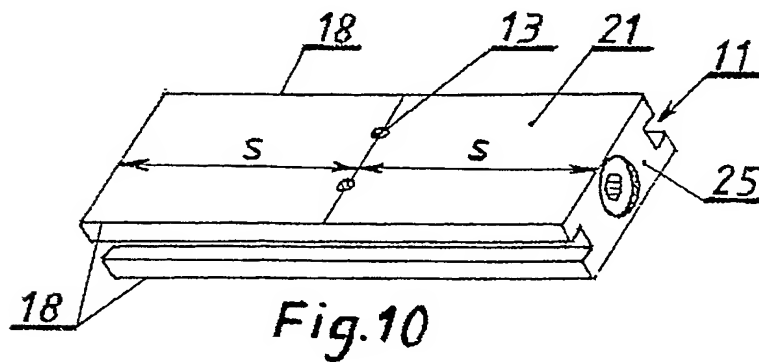
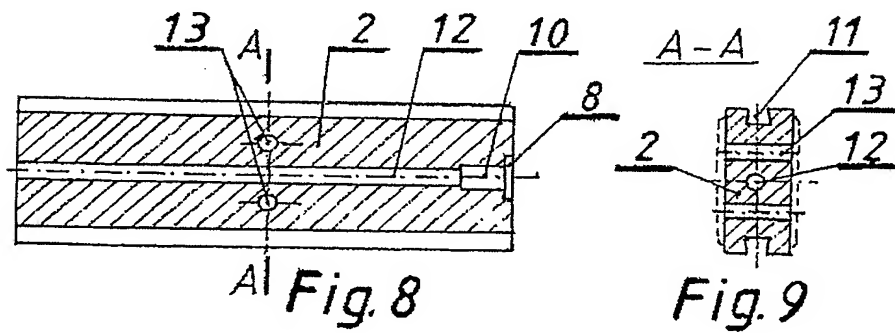
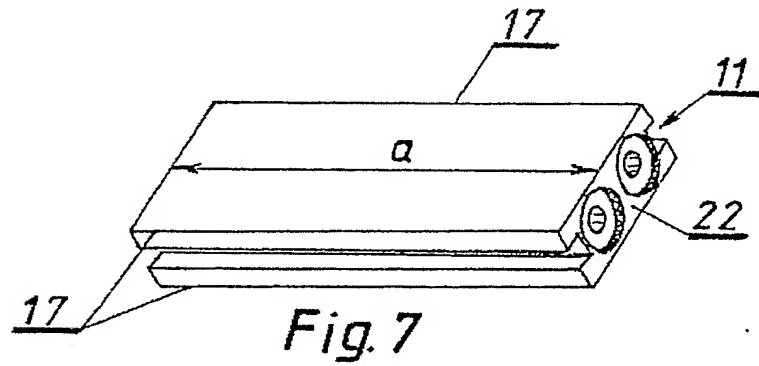
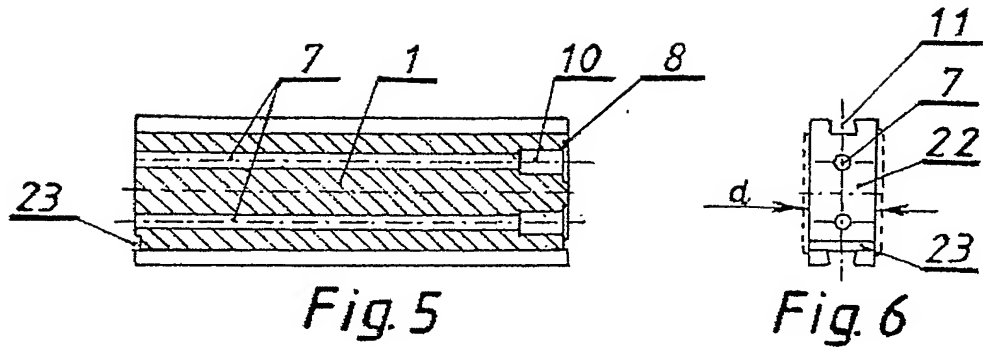
6. The unit according to the claim 1, characterised in that in order to construct arched profiled walls it is provided with the distance pads 20 in a form of tongues, mounted in front of the convex section, between the side surfaces 21 of the vertical fastener 2 and the frontal surfaces 22 of the horizontal fastener 1.
7. The unit according to the claim 1, characterised in that the longitudinal holes 7 and 12 with the mortises 10 are given a form of the grooved recesses 7a and 12a with the mortises 10a, made through the whole length of the horizontal and vertical fasteners 1 and 2.
8. The unit according to the claim 7, characterised in that the grooved recesses 7a and 12a of the horizontal and vertical fasteners 1 and 2 have the arch-shaped bottoms 26, adjusted to the oval shape of the bolt 4 of the threaded fastener, and made at such the depth, which enables longitudinal and centric positioning of the threaded fasteners.

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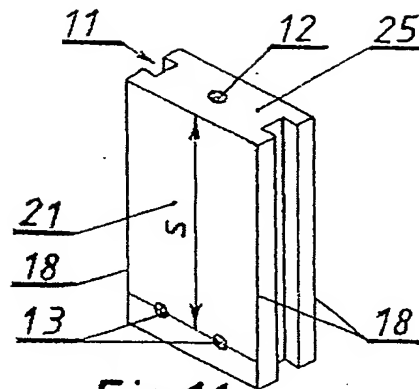


Fig. 11

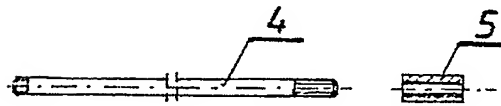


Fig. 12

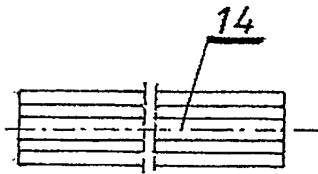


Fig. 13

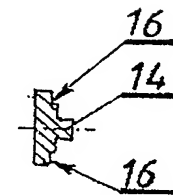


Fig. 14

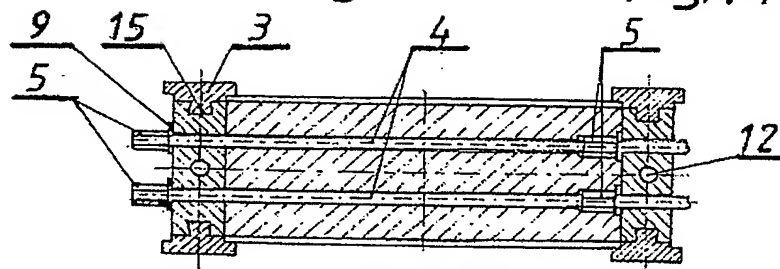


Fig. 15

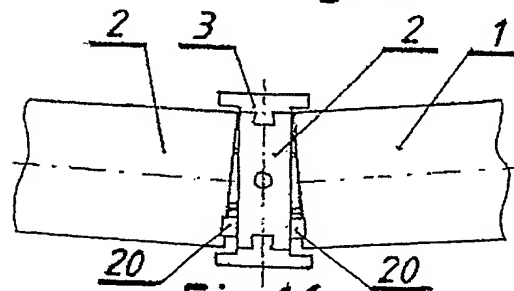


Fig. 16

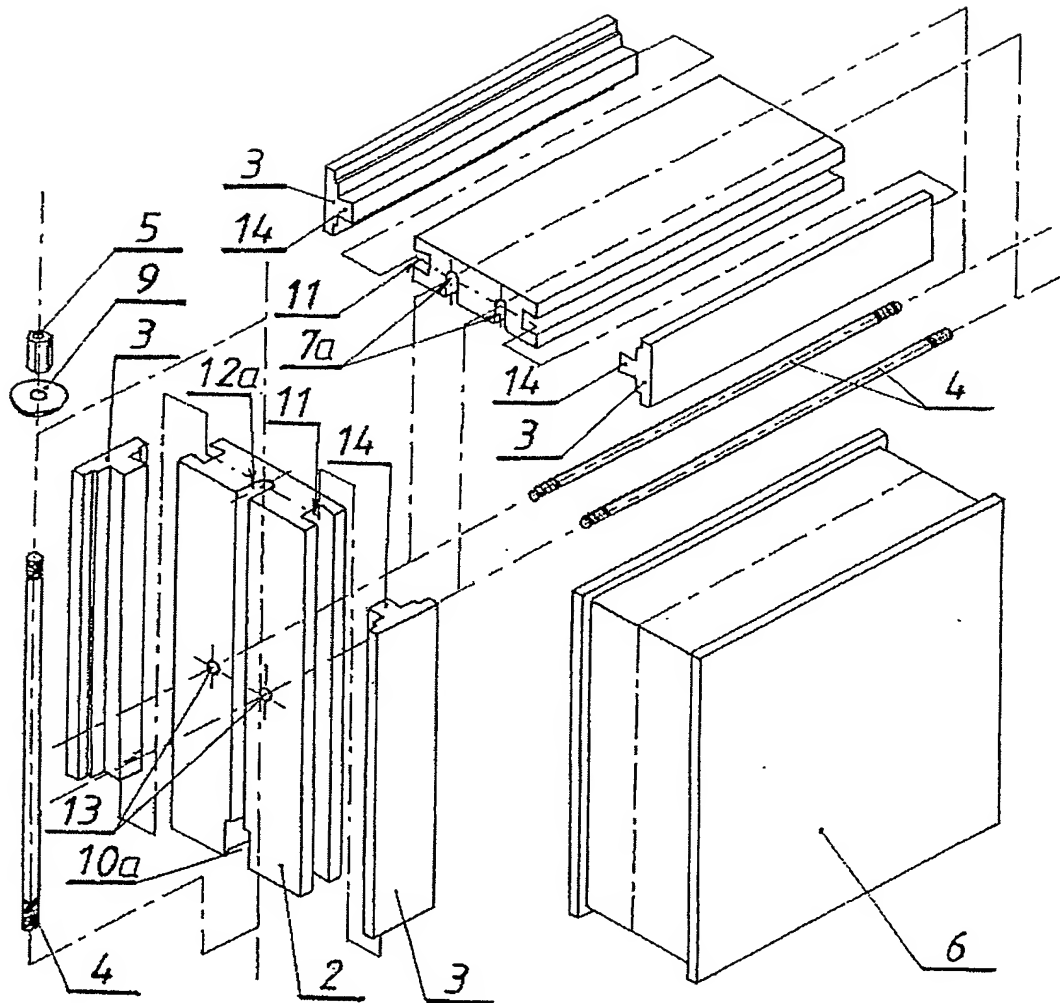


Fig.17

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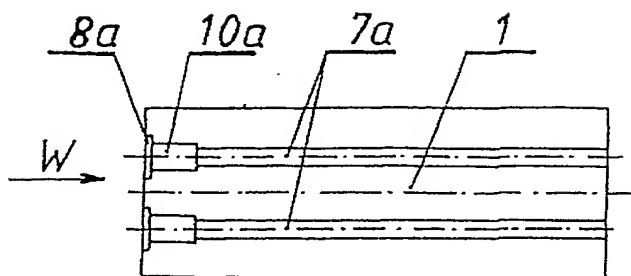


Fig. 18

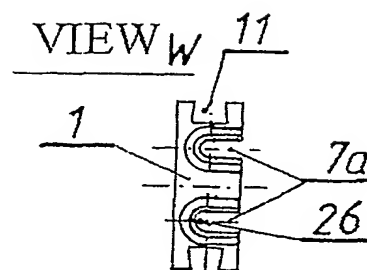


Fig. 19

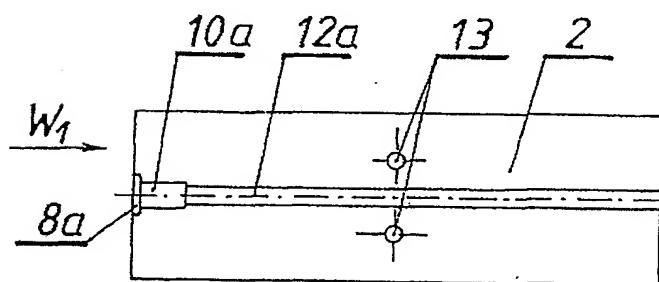


Fig. 20

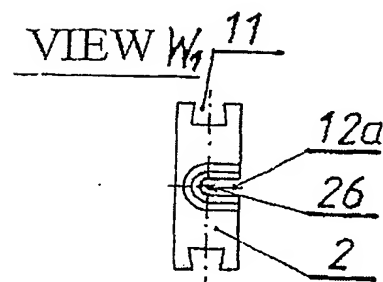


Fig. 21

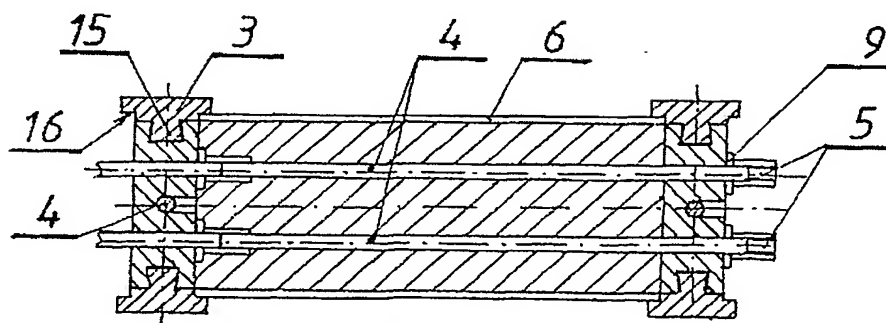


Fig. 22

A. CLASSIFICATION OF SUBJECT MATTER IPC 7 E04C1/42 E04B2/10		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC 7 E04C E04B		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) PAJ, EPO-Internal		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 1999, no. 04, 30 April 1999 (1999-04-30) & JP 11 022100 A (SHOEI:KK), 26 January 1999 (1999-01-26)	1,4,5,7, 8
Y	abstract ---	2,3,6
Y	US 5 031 372 A (MCCLUER STEVE) 16 July 1991 (1991-07-16) column 3, line 32 -column 5, line 52; figures 1,2,5,6 ---	1
Y	DE 91 12 250 U (LIU CHEN-SHIAO) 19 December 1991 (1991-12-19) page 2, line 30 -page 3; figures 1,3 --- -/--	1
<div style="display: flex; justify-content: space-between;"> <input checked="" type="checkbox"/> Further documents are listed in the continuation of box C. <input checked="" type="checkbox"/> Patent family members are listed in annex. </div>		
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Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016		Authorized officer <div style="text-align: center; font-size: 1.2em;">Khera, D</div>

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	US 5 992 111 A (WATERHOUSE DIANNE) 30 November 1999 (1999-11-30) column 5, line 51 - line 67; figure 8	6
A	US 2002/014050 A1 (VAN DER HEIJDEN FRANCISCUS ANT) 7 February 2002 (2002-02-07) paragraph '0027! - paragraph '0029!; figures 1-3	4,7

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